Department of Energy - Office of Science

DOE Atmospheric Science Program

Progress Report on Aerosol Radiative Forcing of Climate

BERAC Meeting April 20, 2005

Peter Lunn

Program Director for Atmospheric Science

Program Goals and Focus

Long-Term Goal --- developing comprehensive understanding and representation of the atmospheric processes that control the transport, transformation, and fate of energy related trace chemicals and particulate matter.

Focus --- aerosol radiative forcing of climate, i.e., aerosol chemical, microphysical, and optical properties, including their geographical and vertical distribution and the rates and mechanisms of their evolution:

1. Sources of particles and gaseous precursors
2. Transport of particles and gaseous precursors, local-to-regional scales with scientific and programmatic connections to larger scales
3. Concentrations of gas-phase aerosol precursors
4. Characterization of aerosol properties
5. Aerosol transformations
6. Atmospheric radiation (characterization of aerosol influences)

BERAC Report

Research Announcement

Science Team

Deliverables

Partnerships

Field Campaigns

Working Groups

Science Steering Committee

Science Team Meeting

Science Team

- Aerodyne
- Argonne
- Boston College
- Brookhaven
- Cal Tech
- Desert Research Inst.
- EPRI
- Los Alamos
- Lawrence Berkeley
- Livermore
- MIT
- NASA Langley
- NCAR
- NOAA CMDL
- NRL
- ORNL
- PNNL
- SUNY Albany
- SUNY Old Westbury
- TropoChem
- UC Irvine
- UCLA
- UC Riverside
- U Colorado
- U Miami
- U Minnesota

Science Steering Committee

Peter H. Daum	Brookhaven
J. Christopher Doran	PNNL
Jeffrey S. Gaffney	Argonne
Steven J. Ghan	PNNL
Chris A. Hostetler	NASA Langley
Sasha Madronich	NCAR
Luisa T. Molina	MIT
John H. Seinfeld	Cal Tech

Chairman and Chief Scientist: Stephen E. Schwartz Brookhaven

Working Groups

- Instrument Development
- Laboratory Studies
- Field Studies
- Model Development and Evaluation

- Gas-Particle Interaction
- New Particle Formation
- Aerosol Optical Properties
- Cloud-Aerosol Interactions

- MASE 2005
- MAX-Mex 2006
- Houston 2006
- St. Louis 2007

Field Campaigns

MASE: MArine Stratus Experiment

MAX-Mex: Megacity Aerosol eXperiment – Mexico City

Houston 2006 and St. Louis 2007 Under Consideration

MASE

July 2005 @ Point Reyes, California

Aerosols and Marine Stratus Clouds.
Indirect Aerosol Effects.
Cooling.
Very Large Uncertainties.
Connections between aerosol loading and reflectivity.
Connections between aerosol properties and precipitation.
Ground-based Measurements.
G-1 and Twin Otter Airborne Measurements.

MAX - Mex

February-March 2006 @ Mexico City

Megacity Aerosol Exportation to the Global Environment.
Characterize the Chemical, Physical, and Optical Properties
of Aerosols from a Megacity Source and the Production of SOAs
and Inorganic Aerosols.
Evaluate the Rates and Yields of both Primary Particle Aging
and Secondary Aerosol Conversions from a Megacity.
Extensive Ground-based Measurements.
G-1, Lear Jet, C-130 (NSF), and DC-8 (NASA) Airborne Measurements.

Partnerships

ARM	MASE – AMF Deployment
NRL and Cal Tech	MASE – CIRPAS Aircraft
NASA Langley	Cost Sharing and NASA Aircraft
NSF MIRAGE-2006 and Molinas' MCMA-2006	
NARSTO	Coordination and Data Archiving
CCPP	Incorporation of Models and Parameterizations developed by ASP

Program Deliverables

Models and parameterizations that effectively represent aerosol properties and processes required to compute aerosol radiative forcing of climate in large-scale climate models, together with an assessment of their accuracy and limitations.

- Relating aerosol light scattering and absorption, including dependence on relative humidity and other controlling variables, to aerosol chemical and microphysical properties.
- Relating cloud microphysical properties and dependence on controlling variables, to concentration, and chemical and microphysical properties of pre-cloud aerosol.
- Relating evolution of aerosol composition and microphysical properties, and optical and cloud nucleating properties, to concentrations of precursor gases, properties of the pre-existing aerosol, cloud processing, and other controlling variables.

Program Website

www.asp.bnl.gov

- Presentations from the January 2005 Science Team Meeting
- Scientific and logistical details of planned field campaigns